



PROCEEDINGS

OF THE

CALIFORNIA ACADEMY OF SCIENCES

FOURTH SERIES

Vol. XIII, No. 7, pp. 131-136, pl. 1.

MARCH 18, 1924

VII

FRESHWATER MOLLUSKS OF EAGLE LAKE, CALIFORNIA

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The present paper is based on a collection of freshwater mollusks which was obtained in Eagle Lake, California, in June, 1923, by Mr. Joseph Mailliard, Curator of Ornithology, California Academy of Sciences. When Mr. Mailliard announced his intention of working in that general region during the early summer, special request was made for him to examine the shores of the lake and collect some shells, if possible. He very kindly went out of his way to do this and was rewarded by securing the material enumerated below. The number of species collected is not large, but in most cases they are represented by many specimens.

Eagle Lake is the lowest point of a small isolated drainage basin in the lava area of Lassen County, northeastern California. It is very irregular in outline but approximately twelve miles long and eight miles wide at the widest part. Pine Creek is the only named tributary and there is no surface outlet. It has been described as " . . . large, deep and irregular in outline. Apparently it was once a tributary to Lake Lahontan but is now separated from Honey Lake Basin by a wall of permeable rock, from the base of which

many springs unite to form a branch of Susan Creek. The water of Eagle Lake is clear and cold. The western and southern shores are largely forested. The surface level is subject to periodical fluctuations, recently rising so high as to submerge a considerable area and kill many large conifers."¹

Professor Snyder determined from a study of the fishes that the lake once formed a part of the vast Lake Lahontan Basin and the intimate relationship thus established calls for a comprehensive biological study which cannot here be attempted. The origin, development, subsidence and physical characteristics of Lake Lahontan have been philosophically described by I. C. Russell in 1885.² A summary of his conclusions (p. 250) and his map were reproduced by Professor Snyder, who found evidence among the fishes to warrant the questioning of the "second complete dessication" of the basin so far as Pyramid and Winnemucca lakes are concerned. The mollusks furnish further evidence which indicates that these two did not completely disappear during the last subsidence.

A comprehensive study of the living and fossil mollusks of the entire Lahontan Basin is badly needed to secure data for geological correlation. We know that in it flourished a remarkable fauna of a few very prolific species. These belonged to genera which were widespread in the west during Pliocene and Pleistocene time. *Carinifex* was probably the most widely dispersed of all, although *Parapholyx*, *Lanx* and *Vorticifex* occurred over large areas. The vast change of climate during the epochs mentioned caused equally great changes in much of the fauna; most noticeable of these is probably that of the mammals as shown by the bones in tar pits of southern California.

The great lake systems of California, Oregon, Idaho and Nevada have largely disappeared on account of the present period of extreme drouth. But they have left a few remnants, here and there, in which mollusks continue to thrive

¹ Snyder, J. O., Bull. U. S. Bureau Fisheries, Vol 35, Doc. 843, 1917, p. 34. "The Fisheries of the Lahontan System of Nevada and Northeastern California." Many references to pertinent literature are contained in this paper.

² U. S. Geol. Surv. Monograph 11, 1885.

and these are as interesting to the conchologist as the saber-tooth tiger and the ground sloth are to the mammalogist. The present lake basins are insular in character and display, in their isolation, many of the features of oceanic islands. This is well brought out by Professor Snyder in his study of the fishes and is probably true of several other aquatic groups of animals as well.

Since mollusk shells can be had in some cases from the earliest sediments deposited in the basins to the present time, these organisms furnish an excellent opportunity to study questions of variation due to changes in salinity and passing time. But, unfortunately, the field work for such undertaking has been far too meager for generalization. Almost the only collections heretofore made in the region have been picked up incidentally by persons engaged in other work. Eagle Lake is one of the more important of these residual bodies of water but almost nothing is known of its geological history. That it has retained at least a portion of its fauna through part of the great lava flow of northeastern California is significant in itself.

The mollusks of the lake have scarcely been noticed if one may judge by available records. The *Carinifex* which lives there has been referred to twice, first as genus only by Stearns in 1891.³ The next record as *C. newberryi* is by Pilsbry in 1899,⁴ from collections made by R. C. McGregor, then doing work for the U. S. Bureau of Fisheries. The latter also collected *Goniobasis nigrina* (Lea) in a small spring near the lake and *G. acutiflora* Stearns and *Fluminicola seminalis* (Hinds) in a small creek at the lake. Further than these I know of no records.

1. *Carinifex occidentalis* Hanna, new species

Plate 1, figures 1-9

Shell similar to *C. newberryi* (Lea) but smaller for same number of whorls, axial sculpture very much finer, and color much paler; the type has $4\frac{1}{4}$ whorls including the rounded

³ Nautilus, Vol. 4, 1891, p. 122.

⁴ Nautilus, Vol. 13, 1899, p. 65.

nuclear whorl; all except this have a sharp carina on the upper shoulder which is indistinctly beaded by crossing of axial sculpture; shoulder very slightly concave; umbilicus wide and bounded externally by a sharp carina. Diameter of type, 13.5 mm.; altitude, 9.3 mm.; diameter of umbilicus 6 mm.

Type: No. 1610 and paratypes Nos. 1611-1618, Mus. Calif. Acad. Sci., collected by Mr. Joseph Mailliard in June, 1923, in Eagle Lake, Lassen County, California.

My attention was called to this species in 1920 by Mr. Barbat who, with Mr. T. C. West of the U. S. Forest Service, collected a few specimens near Galatin on Eagle Lake. The large collection brought in by Mr. Mailliard consists of 479 specimens. Considerable variation in shape is shown in the series and the extremes are figured to aid in recognition. In no case did there appear to be a tendency toward malleation of the shell, a character sometimes attributed to changing salinity of the habitat.

For some time I have had in preparation a review of the species of the genus *Carinifex* and, pending its publication, it will be sufficient to state that the Eagle Lake species is most like *C. newberryi* of the described forms. That species is the type of the genus and has a larger, heavier, darker and more coarsely sculptured shell. The type specimen, figured by Binney, evidently came from "Canoe Creek," California (now called Hat Creek, a tributary of Pit River) and not from Klamath Lake. The species from the latter place was described by E. A. Smith as *C. ponsonbii*; the form in Clear Lake was named *C. newberryi minor* by Cooper but is one of the most distinct species.

1. *Parapholyx mailliardi* Hanna, new species

Plate 1, figures 10-24

Shell large and robust, spire depressed, consisting of about $2\frac{3}{4}$ whorls; marked in type specimen only with fine regular lines of growth, grouped into irregular ridges near the aperture; in other specimens (as figures show) heavy costæ may be developed; imperforate; columella slightly thickened;

peristome broadly reflected but with sharp margin. Diameter of type, 13.4 mm.; altitude, 9.3 mm.

Type: No. 1619; paratypes, Nos. 1620-1634, Mus. Calif. Acad. Sci., collected by Mr. Joseph Mailliard in June, 1923, in Eagle Lake, Lassen County, California.

The large size, depressed spire and reflected peristome serve to distinguish this species from others of the genus. Variation in strength of costæ is excessive and parallels a case Hemphill found in shells from the Columbia River, Oregon, at The Dalles. The same is true of shells from Pyramid Lake, Nevada, and the Lahontan Basin generally. *P. effusa* (Lea), type of the genus from the Sacramento River, does not appear ever to be costate.

In all, 250 specimens were secured by Mr. Mailliard for whom the species is named.

3. *Planorbis parvus* Say

The collection contains seventy-five specimens from Eagle Lake, which have been referred to this species. They agree in shape and size with material from a large number of localities in California and Oregon. Equally worthy of note is the fact that constant differences are displayed in the aperture from *P. scabiosus*, as pointed out under the description of that form.⁵

4. *Valvata humeralis* Say

Over 200 specimens were collected in Eagle Lake. They are remarkably uniform in shape throughout, in marked contrast with *V. utahensis* Call⁶ and *V. oregonensis* Hanna⁷, which inhabited nearby lakes in a previous geological period. Living examples collected by Hemphill at Old Mission, Idaho, are not distinct from those from Eagle Lake. In placing the species under *humeralis* I believe I am in accord with the views of Dr. Bryant Walker, who found the species in

⁵ *Planorbis scabiosus* Hanna, Univ. Oregon Publ., Vol.1, No. 12, 1922, p. (4), pl. 1, figs. 4-6; Pliocene, Warner Lake beds, eastern Oregon.

⁶ Call, U. S. Geol. Surv. Bull. 11, 1884, p. 44, pl. 6, figs. 1-3.

Utah.⁸ Mr. Hannibal likewise was of the opinion that the widespread *Valvata* of the west was referable to *humeralis*.⁹ Dr. Pilsbry stated¹⁰ that it is a Mexican species and was led to "expect it in suitable places over a considerable territory within our limits. It is quite unlike *V. virens* of the Rocky Mountain region, having more in common with the northern *V. sincera* Say." I have compared it directly with a large collection of *V. virens* from Clear Lake, California, the type locality; the latter species has a high spire and narrow umbilicus, while the Eagle Lake specimens are more like *V. sincera* as figured by Walker¹¹ from Anticosti.

5. *Physa*, species?

A single specimen of *Physa* occurs in the collection from Eagle Lake. It is not fully adult but is evidently one of the smooth forms. Nomenclature in this genus is so hopelessly confused that identification with named species becomes little more than guess work and the naming of additional ones, be they valid or otherwise, only adds to the difficulties. The same is true of the members of the following genus.

6. *Pisidium*, species?

The collection contains thirteen valves of a species of *Pisidium* from Eagle Lake. Whether it is a named form or not is impossible to determine at this time. The group, like *Physa*, needs a competent monographer, and until he arrives it would seem best not to add to his difficulties by naming one or more unrecognizable species out of each lot collected, as sometimes has been done.

⁷ Hanna, Univ. Oregon Publ., Vol. 1, No. 12, 1922, p. (11) pl. 3, figs. 1-8, pl. 4, figs. 1-4.

⁸ Nautilus, Vol. 20, 1906, p. 26.

⁹ Nautilus, Vol. 23, 1910, p. 105.

¹⁰ Nautilus, Vol. 19, 1906, p. 105.

¹¹ Nautilus, Vol. 20, 1906, pl. 1, figs. 4-6.